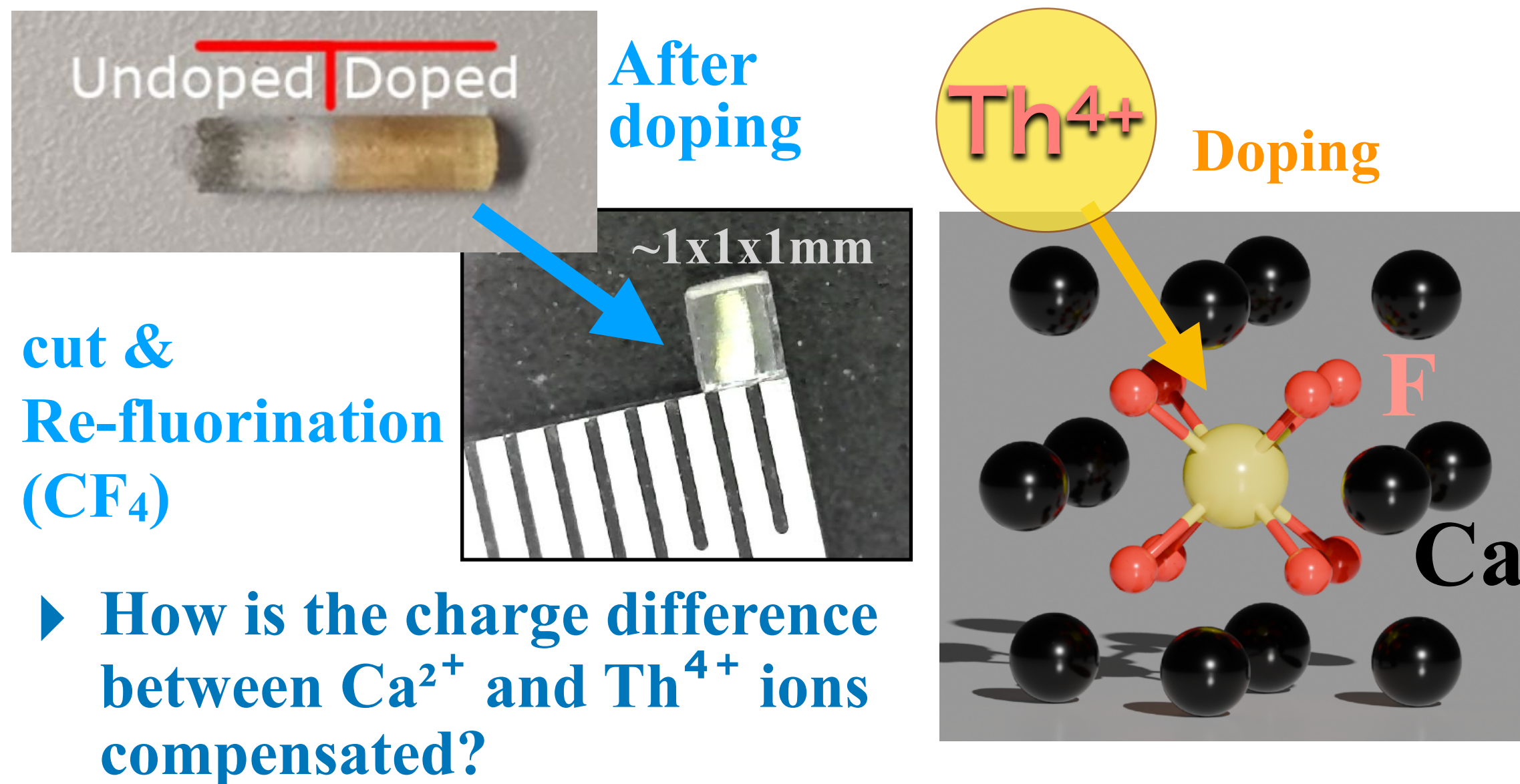


# Evaluation of Actinide-Doped Crystals via X-ray Spectroscopy for Solid-state Nuclear Clock

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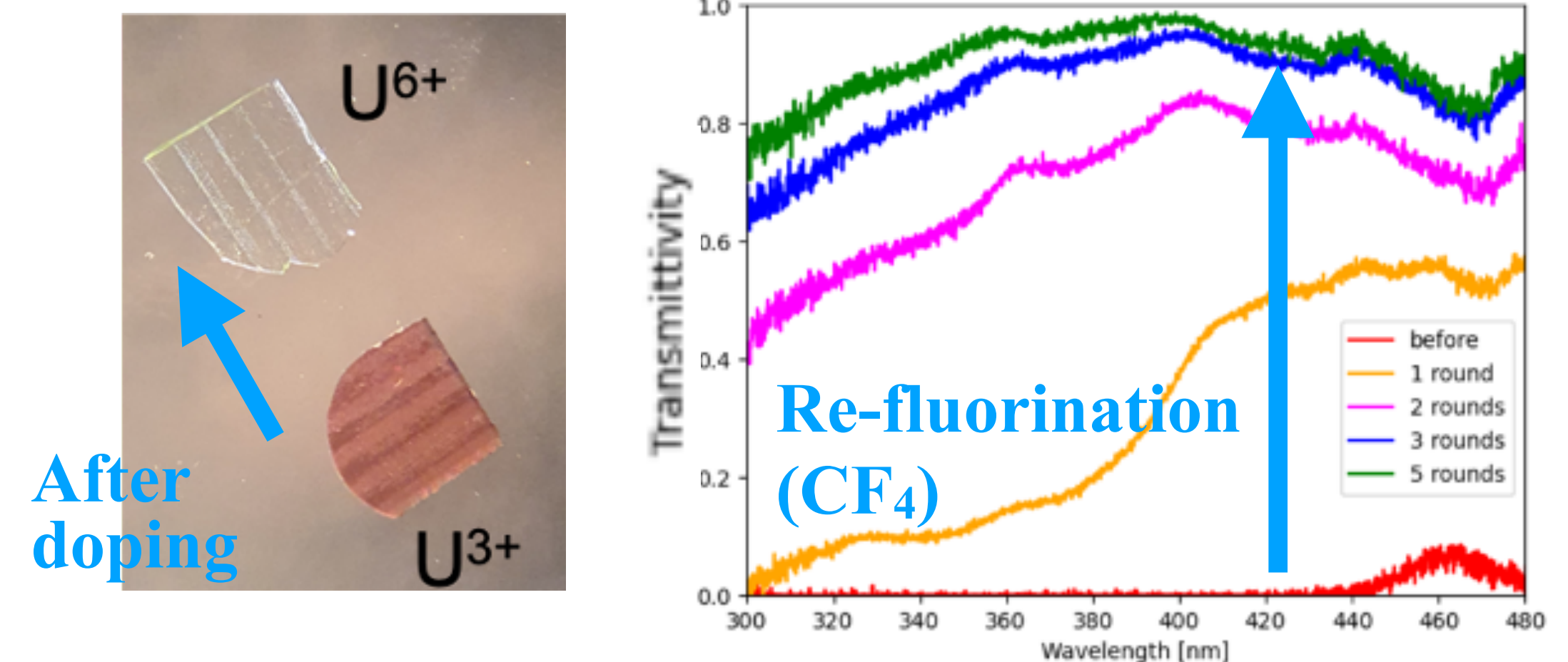
## $^{229}\text{Th}:\text{CaF}_2$

- Thorium-229 has a low first excited state at around 8 eV and can be directly excited by a VUV laser.
- Candidate for a 'solid-state nuclear clock.'



## $\text{U}:\text{CaF}_2$

- $\text{U}:\text{CaF}_2$  has interesting applications as a laser material.
- uranium can exist in multiple charge states, from 3+ to 6+, depending on the growth conditions.



- Establishing a method to control uranium valence enables new application for  $\text{U}:\text{CaF}_2$ .

**Method:** Using X-ray absorption fine structure spectroscopy (XAFS), a powerful tool to evaluate both the ionic valence and local structure of crystals even in dilute samples.